

Mouse Heart Experiment Proposal

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Purpose:

- 1) To experimentally determine the pacing threshold of the atrium and ventricle.
- 2) To experimentally determine the electrical pathway impedance of a mouse and its respective heart impedance over a range of frequencies.
- 3) To determine the appropriate pacemaker lead fixation type (corkscrew, hook,plunge).
- 4) To measure the length, width, and height of a mouse heart.
- 5) To experimentally determine the maximum voltage and current that can be delivered to the mouse heart (i.e burn marks, smoking, etc.)

Equipment:

3 Mice, Calipers, Function Generator (5Hz-500MHz, 0V-3V, 1A), Spectrum Analyzer, Current Probe (5Hz-500MHz, 1A), Leads, BNC Cables, Alligator Clips, Function Generator Cables

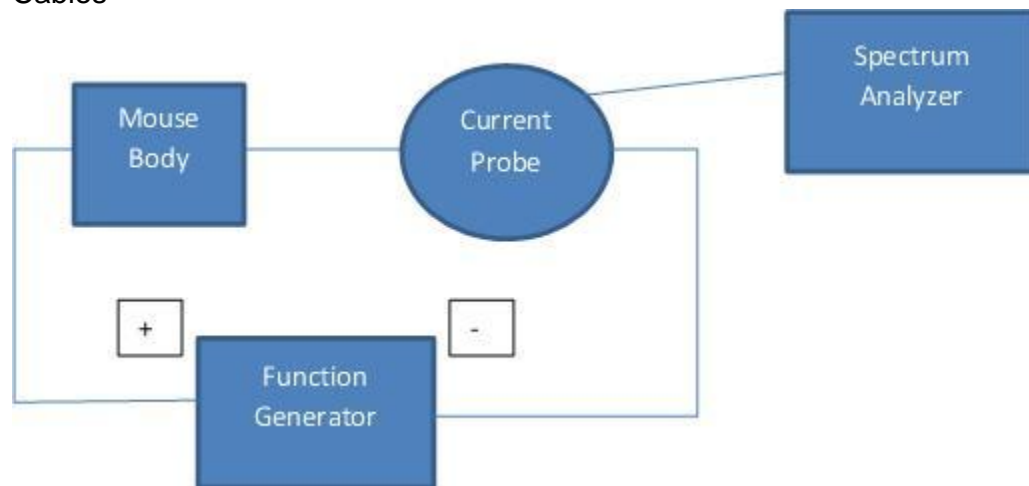


Figure 1

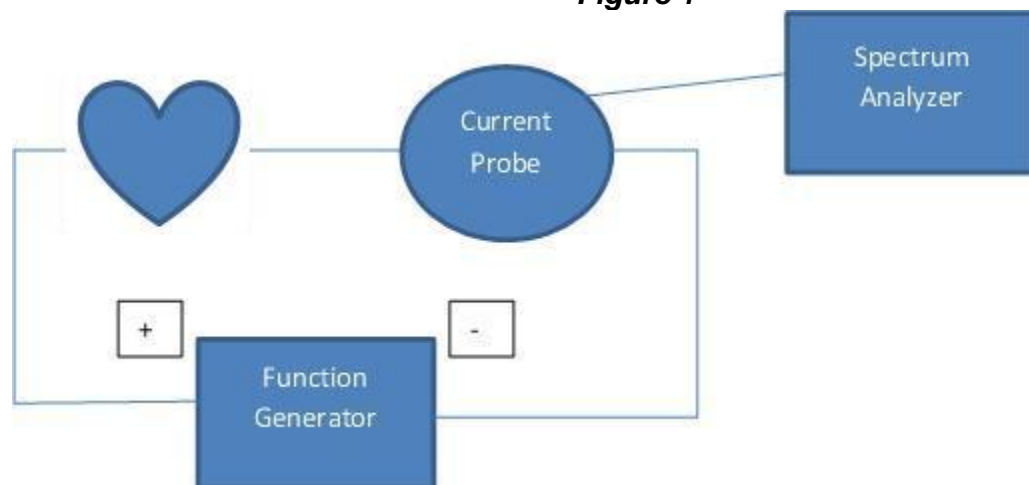


Figure 2

Procedure:

1. Sacrifice the mouse.
2. Measure the pacing threshold of the atrium and ventricle. For the atrium, connect the cathode to the atrial wall and the anode to the apex of the heart. For the ventricle, connect the cathode to the ventricle wall and the anode to the apex of the heart.

NOTE: While measuring the pacing threshold pace above the native rate (~15 Hz)

3. Measure the electrical pathway impedance from the mouse heart to the infrascapular region as depicted in Figure 1 with the cathode in the mouse heart and the anode in the infrascapular region.
4. Connect the heart to the function generator and current probe as depicted in Figure 2.

NOTE: The fixation device will not intrude into the tissue further than 0.5 mm. Each probe will have marks indicating the total length of the probe inside the tissue.

5. With varying frequencies (5Hz to 500MHz) at 0.5V-amplitude, measure the current to calculate the impedance of the atrium.
6. Slowly increase voltage until it is observed that the heart can not electrically withstand any increase in voltage or current. (i.e burn marks, smoking, etc.)
7. Surgically extract the heart.
8. Measure the dimensions of the heart using the caliper (length, width, and height)
9. Repeat steps 6 and 7 for 1, 1.5, 2, 2.5, 3 Volt amplitude.
10. Repeat steps 6, 7 and 8 for the ventricle.
11. Repeat steps 1 through 10 for each mouse using a different fixation for the lead.

Results:

Frequency	Input Amplitude	Voltage Measured	Current Measured	Heart Impedance Calculated
5 Hz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
10 Hz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
	0.5 V			

20 Hz	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
50 Hz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
100 Hz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
500 Hz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
1 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
5 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
10 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
50 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			

	3 V			
100 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
500 kHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
1 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
5 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
10 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
20 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
50 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			
100 MHz	0.5 V			
	1 V			
	1.5 V			

	2 V			
	2.5 V			
	3 V			
500 MHz	0.5 V			
	1 V			
	1.5 V			
	2 V			
	2.5 V			
	3 V			